"Sie ist nicht productiv, sie ist nur sie selbst und hat keine Folgen..... .....Da sie eigentlich nirgends anwendbar ist, so hat sie sich in dem hohen grade in sich selbst ausgebildet. Sie giebt dem Geist eine gewisse beschränkte Befriedigung und ist in ihren Einzelheiten so mannigfaltig, dass man sie unerschöpflich nennen kann, deswegen sie auch vorzügliche Menschen so entschieden und lange an sich festhält.—Etwas Mönchisch-Hagestolzenartiges hat die Krystallographie und ist daher sich selbst genug. Von praktischer Lebenseinwirkung ist sie nicht; denn die köstlichsten Erzeugnisse ihres Gebiets, die krystallinischen Edelsteine, müssen erst zugeschliffen werden, ehe wir unsere Frauen damit schmücken können."

Wülfing remarks "Can it not be doubtful if the sentence of Goethe's' 'crystallography has something of the bachelor monk about it and is hence sufficient unto itself; does not belong to a standpoint of the science already far behind us."

WM. H. HOBBS.

PETROGRAPHY.[1]

An Example of Rock Differentiation.—The Highwood Mountains of Montana have afforded Weed and Pirrson[2] an interesting study in rock differentiation. The mountains comprise a group of hills composed of cores of massive granular rocks surrounded by acid and basic lava flows and beds of tuff, which are cut by hundreds of dykes radiating from the cores as centers. One of these hills, isolated from the others is known as Square Butte, whose laccolitic origin can be plainly shown. The Butte is composed entirely of igneous rocks. Its center is a core of white syenite, and around this as a concentric envelope is a dark basic rock called by the authors shonkinite. Near the top of the Butte the surrounding envelope has been eroded off exposing the white rock, so that from a distance the latter appears to be capping the former. The black rock consists of biotite in large plates and augite crystals, in the irregular spaces between which are found orthoclase, olivine, a little albite and small quantities of nepheline, cancrinte and the usual accessory minerals. An analysis of the rock gave:

[1] Edited by Dr. W. S. Bayley, Colby University, Waterville, Maine.

[2] Bull. Geol. Soc. Amer., Vol. 6, p 389.

SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	H_2O	P_2O_5	Cl	Total
46.73	.78	10.05	3.53	8.20	.28	9.68	13.22	1.81	3.76	1.24	1.51	.18	=100.97

The rock is thus a granular plutonic rock consisting essentially of augite and orthoclase. It is closely related to augite-syenite, bearing the same relation to it as vogesite does to hornblende-syenite.

The white rock associated with the shonkinite is a sodalite-syenite, containing as its bisilicate component only amphibole. Its composition is given as follows:

SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	H_2O	P_2O_5	Cl	Total
56.45	.29	20.08	1.31	4.39	.09	.63	2.14	5.61	7.13	1.77	.13	.43	=100.45

The basic rock is richer in iron, magnesia and lime than the acid one; since the two rocks pass into each other by a rapid but continuous gradation, they are believed to be of the same age and to be the complementary differentiated portions of the same magma. The differentiation in this case could not have been due to a process of crystallization, in which the first crystallized minerals were accumulated in the peripheral portions of the cooling magma, since the other iron-bearing components of the shonkinite and of the syenite are so radically different. The differentiation must have occurred in the magma while still molten.

The Serpentines of the Central Alps.—Three years ago Weinschenck[3] gave a preliminary account of the serpentines of the East Central Alps and their contact effects, showing that the former were originally pyroxene eruptives. In a recent paper he returns to the subject,[4] and in a well illustrated article gives in detail the reasons for his former conclusions. He finds upon the examination of a large suite of specimens that the original rock was an olivine-antigorite aggregate, which he names stubachite, from its most important locality. The antigorite is believed to be an original component and not an alteration product of the olivine, as it is found intergrown with perfectly fresh grains of the latter mineral. The grate structure ("Gitterstructur") of many serpentines is ascribed to such intergrowths, and not to the alteration of pyroxene along its cleavage planes. The original stubachite was a medium grained holocrystalline, allotriomorphic rock of intrusive igneous origin, which has not suffered much alteration since its exposure by erosion.

[3] American Naturalist, 1892, p. 767.

[4] Abhand. d. k. bayer. Ak. d. Wis II, Cl. XVIII, Bd. p. 653.

Becke[5] calls attention to the frequency with which a pyroxenic origin has been ascribed to serpentines of the Alps because of the lack in them of the mesh structure, and questions the safety of this conclusion when based on such scanty premises. He mentions the existence of a serpentine in the stubachthal in the Central Alps, in the freshest portions of which olivine and picotite can be seen in large quantities, and in other portions diopside and olivine. In many specimens the olivine has been crushed into a mosaic, the finer grains of which have been altered into serpentine, clinochlor, antigorite and what is probably colorless pyroxene. The mesh structure is found in the weathered portion of the antigorite-serpentine. It is thought by the author to be due to weathering subsequent to the production of the antigorite.

The central mass of the east central Alps consists of granite and gneiss,[6] of which the former is intrusive in the latter, although both have essentially the same mineralogical composition, and the former is schistose on its periphery. The granite contains zoisite, epidote, orthite, chlorite, calcite, etc., all of which are regarded as original, since the other primary components of the rock from which they may be assumed to have come are perfectly fresh. The origin of these minerals is ascribed to the cooling of the magma under the influence of mountain-making processes—a condition of crystallization which the author designates as piezocrystallization. The hydrated components of the rock are supposed to have been formed with the aid of magma moisture under the influence of pressure. This theory is believed to account for the granulation and other pressure phenomena noted in the granite, as well as for its composition.

Dynamic Metamorphism.—In connection with his work on the rocks of the Verrucano in the Alps, Milch[7] makes a study of dynamic metamorphism and suggests a number of terms to be used in the descriptions of metamorphic rocks. Allothimorphic fragments are those with the composition and forms of the original grains. Authimorphic fragments have the forms of the grains changed but their composition unchanged. Allothimorphic pseudomorphs have the original forms but a composition different from that of the original grains, and authimorphic pseudomorphs have both forms and composition changed, but with the latter dependent upon the original composition. Finally eleutheromorphic new products are those entirely independent of the

[5] Minn. u. Petrog. Mitth., XIV, 1894, p. 271.

[6] Ib., p. 717.

[7] Neues Jahrb. f. Min., etc., IX, p. 101.

original substances both in form and composition. Of the authimorphic fragments two classes are noted, first, the authiclastic, those that have been unable to adapt themselves to the altered conditions and, consequently, which have been fractured, and, second, the kamptomorphic, embracing those fragments that have been able to adapt themselves to changed conditions, and so have yielded to these and have bent, or have assumed abnormal optical properties, such as undulous extinctions. With these terms the author describes some of the rocks studied and states that in many instances no traces of clastic structure remain in them, although they must be regarded as regionally metamorphosed fragmentals. Regional metamorphism, he declares, may be brought about by pressure alone, or by dislocation—pressure with movement (dynamic metamorphism). The former may act slowly, deforming the minerals in rocks, while the latter acts rapidly, shattering them. The latter process usually forms rocks like the mica-schists, with a fine grain, and the former coarse grained ones like the gneisses. Of course, the action of water, which is the agent of transportation of the new substances added during metamorphism, may come into play in each case. The Verrucano rocks exhibit the effects of both kinds of regional metamorphism. The article contains a great many suggestions of interest to students of metamorphism.

Miscellaneous.—The conglomerates and albite schists of Hoosac Mountain, Mass., referred[8] to some time ago in these notes, have been described by Wolff[9] in some detail in his report on the geology of Hoosac Mountain. The conglomerates form gneisses which grade upward into the albite schists. Amphibolites also are described, whose origin is from a basic intrusive rock. A large number of photographs of hand specimens and thin sections of the rocks described accompany the paper.

Van Hise[10] in the report by Irving and himself on the Penokee iron district, gives a number of descriptions of sedimentary and volcanic rocks, illustrated by a large number of plates of thin sections. The rocks discussed include greenstone conglomerates, crystalline schists, intrusive greenstones, slates, quartzites, limestones, etc.

Ries[11] finds that one of the crystalline schists of the series of foliated rocks forming the greater portion of Westchester Co., N. Y., is a

[8] American Naturalist, 1892, p. 768.

[9] Min. XXIII, U. S. Geol. Survey, p. 41.

[10] Mon. XIX, U. S. Geol. Survey.

[11] Trans. N. Y. Acad. Sci., Vol. XIV, p. 80.

plagioclase-augen-gneiss which the author calls a schistose granite-diorite. Its constituents are quartz, plagioclase, biotite, hornblende and orthoclase as its principal components, with garnet, sphene, zircon, apatite, muscovite and microcline as the accessories. The quartz is penetrated by rutile needles. Nearly all the rock's constituents show evidence of dynamic fracturing.

GEOLOGY AND PALEONTOLOGY.

Dawson on the Oscillations of the Behring Sea Region.—Among the recent contributions to a knowledge of the coasts of Behring Sea are the notes made by G. M. Dawson during an extended cruise in that region. His paper is supplementary to that of Dall's relating to the American shores and islands of Behring Seas, and gives, generally speaking, the general physographic features of the land to which the attention of the earlier writer was not directed. We quote the following extracts from his general remarks.

"Behring Sea is a dependency of the North Pacific, marked off from it by a bordering chain of islands like those which outline Okhotsk Sea and the sea of Japan. It differs from these two seas by reason of its connection to the north with the Arctic Ocean, and in the fact that while the whole eastern part of its extent is comparatively shallow, the profounder depths of the north Pacific (in continuation of the Tuscarora deep) are continued into its western part. The Aleutian Islands, regarded as a line of demarkation between the main ocean and Behring Sea, are analagous to the Kurile islands with Kamtschatka, and to the islands of Japan. As to the Commander Islands, though these appear to lie in the continuation of the arc formed by the Aleutians, they are separated by a wide and, so far as known, very deep stretch of ocean from the last of these islands, and it is wholly probable that they may represent an altogether independent local elevation analogous to that to which Saint Matthew and its adjacent islands are due.

"The western part of Behring Sea has as yet been very imperfectly explored with the deep-sea lead, but the following general facts may be gathered from the existing charts: The entire chain of the Aleutian Islands is bordered at no great distance to the south by abyssal depths of the Pacific. The whole western portion of the chain likewise